

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.: 10/631,907 Confirmation No.: 9632
Applicant(s): Litwinski et al.
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Art Unit: 3677
Examiner: F. Saether
Title: RIVETS HAVING HIGH STRENGTH AND FORMABILITY

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APPEAL BRIEF UNDER 37 CFR § 41.37

This Appeal Brief is filed pursuant to the "Notice of Appeal to the Board of Patent Appeals and Interferences" filed June 14, 2006.

1. ***Real Party in Interest.***

The real party in interest in this appeal is The Boeing Company, the assignee of the above-referenced patent application.

2. ***Related Appeals and Interferences.***

There are no related appeals and/or interferences involving this application or its subject matter.

3. ***Status of Claims.***

The present appeal involves claims 38-46, which are presently under a final rejection as set forth in the final Official Action mailed March 14, 2006 and indicated in the Advisory Action dated May 23, 2006. Claims 1-37 have been cancelled. A copy of the claims is included in the Appendix.

4. ***Status of Amendments.***

The claims stand as amended in the Amendment after Final that was filed May 12, 2006. As indicated in the Advisory Action of May 23, 2006, the amendment was entered.

5. ***Summary of Claimed Subject Matter.***

The present application is directed to the manufacture of rivets having high strength and formability. In this regard, the application describes a forming method as well as the resulting rivets that are formed by the method. *See* the present application, Abstract. As illustrated in the application, each rivet can have a shank with a head at one end. An end of the shank that is opposite the head can be upset to form a second head. For example, Figure 1 illustrates a structural assembly 1 that includes first and second structural members 2, 3 that are joined by rivets 4. *See* the present application, page 6, lines 9-16. The shank 10 of each rivet 4 extends through corresponding apertures 5 of the structural members 2, 3, with the heads 11, 12 of the rivet 4 disposed on opposite sides of the structural members 2, 3. *See* the present application, page 7, lines 4-13

The rivets 4 are formed of a metal or metal alloy with a refined grain structure. *See* the present application, page 7, lines 17-24. In this regard, the application describes a process of refining a grain structure of a workpiece 20 using a non-consumable rotating friction stir welding probe 19 that is moved through the workpiece 20 to mix or stir the material of the workpiece and thereby refine the grain structure. *See* the present application, page 7, line 32 – page 8, line 24. A region 22 of the workpiece 20 having refined grain structure is then removed from the workpiece 20 and used as a blank 23 that can be stamped, punched, extruded, or milled for forming the rivet 4. *See* the present application, page 8, line 33 – page 9, line 8.

As described in the present application, the rivets 4 can comprise aluminum, an aluminum alloy, titanium, or a titanium alloy. For example, the rivets can be formed of aluminum alloys such as AA 2017-T4 aluminum alloy or AA 2017-T4 aluminum alloy. *See* the present application, page 3, lines 26-30.

The rivets 4 of the present invention preferably have a refined grain structure with a grain size of less than about .0002 inches (approximately 5 microns). More preferably, the rivets 4 “consist essentially of, according to one embodiment, or substantially comprise according to another embodiment, a refined grain structure with a grain size ranging in order of magnitude from approximately .0001 to approximately .0002 inches (approximately 3 to 5 microns) and having equiaxed shape.” *See* the present application, page 7, lines 17-24. Some such refined grain structures are illustrated in the application. For example, Figures 11 and 12 illustrate at 100 times and 500 times magnification, respectively, the refined grain structure of rivets 4 formed from AA 2195-T6 aluminum alloy. *See* the present application, page 9, lines 9-11. The grain structure of the rivets 4 is distinguished from the grain structure of conventional rivets formed of AA 2017-T4 aluminum alloy, illustrated in Figures 9 and 10 at 100 times and 500 times magnification, respectively. *See* the present application, page 9, lines 11-13.

As described in the present application, the rivets 4 formed according to the present invention advantageously have a refined grain structure that resists the formation and propagation of cracks and, thus, have improved formability so as to resist necking, cracking, or tearing during manufacture and installation. *See* the present application, page 9, lines 14-17. It is believed that the refined grain structure or fine-grain material from which the rivets 4 are formed according to the present invention is more formable than the unrefined grain structure or course grained material used to form conventional rivets, since the former has a greater total grain boundary area to impede dislocation motion. *See* the present application, page 9, lines 17-21. This is contrary to the conventional relationship between grain size and formability that results from cold working, *i.e.*, cold working increases strength and refines grain size, but decreases formability. *See* the present application, page 9, lines 21-24.

Independent Claim 38 is directed to a rivet that includes a shank having a head at one end thereof. The shank and the head “consist essentially of a grain structure having a grain size

between about 3 microns and 5 microns.” The dependent claims add further limitations regarding the material of the shank and head. In particular, the dependent claims recite that the shank and head “comprise a material selected from the group consisting of aluminum, an aluminum alloy, titanium, and a titanium alloy” (Claim 39); “comprise a refined grain structure formed by stirring with a friction stir welding probe” (Claim 41); “comprise aluminum” (Claim 42); “comprise AA 2195-T6 aluminum alloy” (Claim 43); “consist essentially of a series 2000 aluminum alloy” (Claim 44); “consist essentially of AA 2195-T6 aluminum alloy” (Claim 45); and “consist essentially of AA 2017-T4 aluminum alloy” (Claim 46).

6. ***Grounds of Rejection to be Reviewed on Appeal.***

The following grounds of rejection are appealed:

- (1) Claims 38-46 are rejected under 35 U.S.C. § 112, first paragraph.
- (2) Claims 38, 39, 41, and 42 are rejected under 35 U.S.C. § 102(b) as being anticipated by JP 10195567A (“JP ’567”).
- (3) Claims 40 and 43-46 are rejected under 35 U.S.C. § 103(a) as being unpatentable over JP ’567 in view of U.S. Patent No. 4,159,666 to Briles.

7. ***Argument.***

The rejections are respectfully traversed on the following grounds.

A. Claims 38-46 do not contain new matter and the rejection under § 112 has been withdrawn

The final Office Action indicates that all of the then-pending claims (including Claims 38-46) are rejected under § 112, first paragraph¹. See final Office Action dated March 14, 2006, page 2. However, in the subsequent section titled “Response to Remarks,” the Office Action clearly states that this rejection of independent Claim 38 has been withdrawn, noting that

¹ 35 USC § 112, first paragraph: “The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.”

“Applicant has pointed to an example which uses the ‘consists essentially of’ language in referring to the grain size.” See final Office Action dated March 14, 2006, page 4. Thus, it appears that the rejection of Claims 38-46 under § 112 has been withdrawn and the reference to Claim 38 in the section summarizing the § 112 rejection on page 2 of the final Office Action was apparently an error. Nevertheless, Applicant again addresses the rejection below for completeness.

Independent Claim 38 and dependent Claims 39-46 were added in the Amendment filed August 3, 2005. The Office Action dated October 18, 2005 asserted that the “consist essentially of” language in independent Claim 38 constitutes new matter. Applicants traversed this rejection in their response dated December 19, 2005. In particular, Applicants noted that Claim 38 is directed to a rivet having a shank with a head and recites that “said shank and said head consist essentially of a grain structure having a grain size between about 3 microns and 5 microns.” Although the patent application describes embodiments in which the shank and head “comprise” a refined grain structure, the application also discloses that the shank and head can consist essentially of a grain structure having the recited grain size. For example, regarding one embodiment of the present invention, the application states:

The rivets 4 are formed of a metal or metal alloy such that the rivets have a refined grain structure, and preferably a refined grain structure with a grain size of less than about .0002 inches (approximately 5 microns). More preferably, the rivets 4 are formed of a metal or metal alloy such that the rivets consist essentially of, according to one embodiment, or substantially comprise according to another embodiment, a refined grain structure with a grain size ranging in order of magnitude from approximately .0001 to approximately .0002 inches (approximately 3 to 5 microns) and having equiaxed shape.

Present application at page 7, lines 17-24. Thus, the specification of the application clearly does describe the invention as claimed, and Claim 38 (and the dependent claims) presented no new matter.

As noted above, the Examiner then stated in the final Office Action that the rejection of Claim 38 under § 112 was withdrawn. Applicant respectfully requests the Examiner’s confirmation that no claims are rejected under § 112.

B. Independent Claim 38 is patentable over JP '567

Independent Claim 38 stands rejected under 35 U.S.C. § 102(b) as being anticipated by JP 10195567A ("JP '567"). JP '567 is the sole reference cited for the rejection of Claim 38.

Independent Claim 38 is directed to a rivet that includes a shank having a head at one end thereof "wherein said shank and said head consist essentially of a grain structure having a grain size between about 3 microns and 5 microns."

JP '567, the sole prior art reference relied upon for rejection of Claim 38, does not disclose a rivet with the claimed grain structure. In fact, as described below, JP '567 does describe any member that consists essentially of a grain structure having the recited grain size.

JP '567 is directed to a "self-lubricating aluminum composite material having outstanding characteristics of high strength, wear resistance, and self-lubricating properties as well as its production." *See* Translation of JP '567, page 1, Summary. As described by JP '567, "[a] mixture of aluminum or aluminum alloy powder and boric acid is subjected to mechanical alloying treatment in the presence of auxiliary agents of carbon compounds, followed by pressurization under heating." *See* Translation of JP '567, page 1, Summary. The resulting composite material has "aluminum oxide particles, aluminum carbide particles, and boride particles disposed throughout the matrix, with the mean grain size of the matrix being not more than 5 μm , the mean grain sizes of the dispersed aluminum oxide and the aluminum carbide together being not more than 100 nm, and the mean grain size of boride being not more than 1 μm ." *See* Translation of JP '567, pages 1-2, Summary (emphasis added).

JP '567 addresses the difficulties in providing "a uniform dispersion of reinforcing particles in matrix [which] is important for enhancing the characteristics of particle-dispersed type composite material," including "the difficulty of uniformly dispersing the particles because the specific gravity of boride particles differs greatly from that of molten aluminum."

Translation of JP '567, page 3, paragraph [0002] (emphasis added). "The purpose" of JP '567 "is to provide self-lubricating aluminum composite material in which the coefficient of friction is decreased and weight loss of the material itself due to wear is reduced, and that also has outstanding characteristics of high strength, wear resistance, and self-lubricating properties while wear of partner material, which lacks wear resistance, is inhibited through the effects of self-

lubricating dispersed particles, as well as its production.” Translation of JP ‘567, pages 3-4, paragraph [0004]. Accordingly, JP ‘567 states that “[a]luminum oxide particles, aluminum carbide particles and boride particles having aforementioned mean grain size are uniformly dispersed at aforementioned volumetric fractions in aluminum or aluminum alloy matrix particles in the aluminum composite material pursuant to the present invention.” Translation of JP ‘567, page 6, paragraph [0012].

Thus, the grain structure of the material disclosed by JP ‘567 includes particles of varying sizes. While the mean grain size of the matrix is not more than 5 μm , the mean grain sizes of the dispersed aluminum oxide and the aluminum carbide together are not more than 100 nm, and the mean grain size of the boride is not more than 1 μm . In other words, the grain sizes of the aluminum oxide particles, the aluminum carbide, and the boride are substantially outside the range recited in Claim 38.

Accordingly, JP ‘567 does not teach or suggest a shank and head of a rivet that consist essentially of a grain structure with a grain size that is between about 3 and 5 microns, as recited in Claim 38.

In this regard, the final Office Action states that JP ‘567 discloses:

a rivet manufactured to include a matrix having a grain size of 5 micrometers or less which is within the claimed range. . . . In regards to claim 38, the material not having the grain size of 5 micrometers or less is such a small percentage of the overall volume (38%) the structure would continue to “consist *essentially* of” the grain size of 5 micrometers also, the small amount of material which does not fall within the claimed range is “about” within the range. As discussed further below, “consist essentially of” is to be construed as equivalent to “comprising”. See, e.g., *PPG*, 156 F.3d at 1355, 48 USPQ2d at 1355. Furthermore, the preamble uses “comprising” thus not limiting the rivet to the claimed 3 to 5 micrometers.

Final Office Action dated March 14, 2006, pages 2-3 (emphasis in original).

Applicant disagrees with the Examiner’s above contention on multiple grounds, each discussed below. First, Applicant disagrees with the above characterization that “the material not having the grain size of 5 micrometers or less is such a small percentage of the overall volume (38%) the structure would continue to “consist *essentially* of” the grain size of 5 micrometers.” Second, Applicant disagrees with the Examiner’s contention that “the small

amount of material which does not fall within the claimed range is 'about' within the range."

Third, Applicant disagrees that "consist essentially of" is equivalent to "comprising." Fourth, Applicant disagrees that the use of the term "comprising" in the preamble of Claim 38 somehow eliminates the requirement of the claimed range.

Applicant first addresses the Examiner's contention that a structure having 38% of material outside the claimed range nevertheless "consists essentially of" material of the claimed grain size. In this regard, Applicant has previously explained that, given the significance of the grain size to the formability of the rivets of the present invention, a composite material that has a volume of as much as 38% of material outside the claimed range cannot be considered to "consist essentially of" the claimed material. In response to Applicant's prior remarks, the final Office Action further states:

[T]he examiner maintains that even at 38% other material Japan '567 continues to meet the limitation as to "consist essentially of" a grain size of 5 microns since the applicant has not shown that it materially effects the basic and novel characteristics of the invention. The phrase "consisting essentially of" limits the claim to the specified material "and those that do not materially affect the basic and novel characteristic(s)". *In re Herz*, 537 F.2d 549, 551-52. 190 USPQ 461. 463 (CCPA 1976) (emphasis in original) and applicant has the burden of showing that the introduction of additional components would materially change the characteristics of applicants' invention. *In re Lajarte*, 337 F.2d 870. 143 USPQ 256 (CCPA 1964). The mere statement that 38% of the volume of material is outside of the claimed range is insufficient to show that it changes the material characteristics.

Final Office Action dated March 14, 2006, pages 5-6 (emphasis in Office Action).

Even if the phrase "consisting essentially of" limits the claim to the specified material and those that do not materially affect the basic and novel characteristics, that feature alone distinguishes JP '567 because JP '567 includes materials that affect the basic and novel characteristics described in the present application, i.e., the characteristics resulting from the claimed refined grain structure such as resistance to the formation and propagation of cracks and improved formability to resist necking, cracking, or tearing during manufacture and installation of the rivets. *See* the present application, page 9, lines 9-24.

Moreover, Applicant asserts that no further showing or evidence of this distinction is required. In particular, Applicant disagrees with the Examiner's reliance on *In re Lajarte*, 337

F.2d 870 as requiring any further showing that the introduction of additional components would materially change the characteristics of the Applicant's invention. *In re Lajarte* concerned an application for a glass suitable for use as an electrical insulator and having, *inter alia*, high resistance to perforation by high-voltage electric current. The patent applicant further "alleges that a glass having all of the desired properties can be obtained by making a glass having the composition set forth in the claims." *In re Lajarte* at 872. The Court of Customs and Patent Appeals stated that "Claim 11 which recites 'consisting essentially' the named ingredients does not exclude small amounts of other materials which do not change the essential character of the composition." *Id.* at 873. Further, the court stated that "here appellant has the burden of showing the basic or novel characteristics of his insulting glass" and determined that "[h]e has met this burden by pointing out in his specification and claims the great increase in resistance to perforation resulting from his composition." *Id.* at 874. Indeed, the court considered the contentions of the Board of Appeals and solicitor "that appellant had furnished no evidence that a critical difference in appellant's emphasized characteristics would result from the introduction of small amounts of [the materials used in the cited prior art reference]," and specifically declined to require further evidence from the appellant. According to the court, "Appellant, in showing that his glass has basic and novel properties (at least as far as the record is concerned), would appear to have met his burden." Further, the court held that "[a]dmittedly, the differences [between the appellant's glass and the glass of the prior art reference] are small, but [the prior art reference] is devoid of any suggestion of a glass embodying these differences. The examiner has failed to suggest any reason for omitting carbon and sulfur from the [prior art] glass. If one were making a colorless glass free of carbon and sulfur, there would be little reason for using the [prior art] formula since it was primarily designed to enhance color stability." *Id.* at 875. Accordingly, the *Lajarte* court reversed the decision of the Board of Appeals.

Just as the applicant in *In re Lajarte* alleged that his claimed glass composition provided the desired properties such as resistance to perforation by high-voltage electric current, Applicant of the present invention has similarly described that desired properties such as resistance to cracks and improved formability are achieved by the presently claimed invention. Further, similar to the applicant in *In re Lajarte*, the Applicant of the present invention has met the

burden of showing the basic or novel characteristics of the invention by pointing out the improvements in the material properties that result from the claimed invention. Also, in the present application, Applicant is not required to provide further evidence, such as by duplicating the JP '567 material to compare its properties to those of the claimed invention.

Further, and again similar to *In re Lajarte*, JP '567 is devoid of any suggestion of a rivet that embodies the differences identified above. The final Office Action does not suggest any reason for omitting any of the three components of the composite material disclosed by JP '567 that have grain structures outside the recited range. By reasoning parallel to that of the *In re Lajarte* court, if one were making a rivet having high strength and formability, there would be little reason for using the composite material of JP '567 since it was primarily designed to provide self-lubricating characteristics. Nor would there be any reason to omit the three components having grain structures outside the recited range, given the teaching of JP '567 for including these materials in particular ranges of amounts for attaining the stated objectives of the reference.

Applicant now addresses the Examiner's second contention that "the small amount of material which does not fall within the claimed range is 'about' within the range." Claim 38 recites a grain size between about 3 microns and 5 microns. As previously described, JP '567 states that the mean grain sizes of the dispersed aluminum oxide particles and aluminum carbide particles are together not more than 100 nm, and the mean grain size of the boride particles are not more than 1 μ m. Materials of such grain sizes are not "between about 3 microns and 5 microns" as claimed. Indeed, even at the largest values disclosed by JP '567, the mean grain size of the boride particles is no more than 1/3 of the size of the smallest value in the claimed range, and the mean grain size of the aluminum oxide and aluminum carbide particles is no more than 1/30 of the size of the smallest value in the claimed range. Average grain sizes that are (at maximum) 1/3 or 1/30, respectively, of the minimum value in the claimed range are not "'about' within the range." Thus, the aluminum oxide particles, aluminum carbide particles, and boride particles are not within the claimed range (or even "about" within the claimed range), and the material described by JP '567 therefore does not consist essentially of a grain structure having a grain size within the claimed range.

Turning now to the contention set forth in the final Office Action that “consist essentially of” is equivalent to “comprising,” Applicant again disagrees. As quoted above, the final Office Action indicates that this contention is “discussed further below” and cites *PPG*, 156 F.3d at 1355, 48 USPQ2d at 1355. *PPG* is not discussed or cited elsewhere in the final Office Action. It appears that the further discussion occurs on page 5 in the passage that states:

Furthermore, the claims only require the material to “consist essentially of” of an aluminum alloy so even assuming that the entirety of the material is not an “aluminum alloy” the “essentially of” leaves open the inclusion of other material(s).

Final Office Action dated March 14, 2006, pages 5.²

The term “consisting essentially of” is not equivalent to the term “comprising” as asserted in the final Office Action. Indeed, as stated above, the final Office Action refers to *In re Lajarte*, in which the court considered a claim that included the phrase “consisting of” and construed the claim accordingly, not as if the claim merely used the term “comprising” instead. Further, *PPG* does not stand for the proposition that “‘consist essentially of’ is equivalent to ‘comprising.’” To the contrary, the Federal Circuit in *PPG* specifically rejected a claim construction proposed by PPG because the construction “would have the effect of converting the critical claim language from ‘consisting essentially of’ to ‘comprising.’” *PPG Indus. v. Guardian Indus. Corp.*, 156 F.3d 1351, 1355. Similarly, in the present application, equating the “consisting essentially of” language to “comprising” would also be improper.

Applicant now traverses the fourth assertion from the final Office Action noted above, i.e., that the “preamble uses ‘comprising’ thus not limiting the rivet to the claimed 3 to 5 micrometers.” In this regard, the final Office Action states:

Furthermore, as noted above, the preamble only requires the rivet to be “comprising” of a head and shank to “consist essentially of . . . a grain size between about 3 microns and 5 microns” thus the material of the shank which applicant argues as not an having the grain size between about 3 microns and 5 microns could alternatively be considered part of the rivet which as not “comprising” the defined grain size.

Final Office Action dated March 14, 2006, page 6.

² The quoted passage appears to be directed to now-canceled Claim 19 (which included the term “aluminum alloy”) and not Claim 38. Nevertheless, Applicant addresses this passage in case it was also intended to refer to Claim 38.

Thus, the final Office Action seems to suggest that the use of the term “comprising” in the preamble of Claim 38 somehow eliminates the requirement of the claimed range. Applicant disagrees. Claim 38 uses “open” claim terminology in the preamble and “partially open” terminology in the body of the claim. In particular, Claim 38 recites “A rivet comprising . . . a shank having a head . . . wherein said shank and said head consist essentially of a grain structure having a grain size between about 3 microns and 5 microns.” Thus, the use of the term “comprises” in the preamble indicates that the rivet could include elements other than the shank and the head, for example, as second head; however, the use of the term “consist essentially of” in the body of the claim does limit that which the shank and head can include. In other words, while the claim does not restrict the addition of additional elements to the rivet, the claim does restrict the addition of additional materials to the shank and head. As set forth in Claim 38, the addition of elements or materials to the rivet is irrelevant, provided that the rivet includes at least one “shank having a head” and provided that that shank and head “consist essentially of” the recited grain structure. Thus, if a rivet, including a shank and a head, were formed of the material described by JP ’567, the shank and head would include a substantial amount of materials that are substantially outside the range recited in Claim 38.

In any case, JP ’567 does not teach or suggest a rivet that includes a shank and head that “consist essentially of” the recited grain structure. Accordingly, Applicant respectfully submits that the rejection of Claim 38 is improper and Claim 38 is allowable.

C. Dependent 39, 41, and 42 are patentable over JP ’567

Each of the dependent Claims 39, 41, and 42 stands rejected under 35 U.S.C. § 102(b) on the sole basis of being anticipated by JP 10195567A (“JP ’567”). As noted above, JP ’567 does not teach or suggest each of the features of independent Claim 38. Accordingly, Claims 39, 41, and 42 are also patentable over JP ’567 for the same reasons.

Further, dependent Claim 41 provides an additional bases of distinction over JP ’567. More particularly, Claim 41 depends from Claim 38 and further recites that “said shank and said head comprise a refined grain structure formed by stirring with a friction stir welding probe.” In this regard, the final Office Action states that “[t]he stir welding is a product-by-process

limitation wherein it is only the final product considered for patentability.” Final Office Action dated March 14, page 3. Applicant respectfully submits that the feature of Claim 38, i.e., a refined grain structure achieved by friction stir welding, results in a feature of the product itself. Further, the refined granular structure that results from friction stir welding provides an additional basis of distinction over the cited references.

D. Dependent Claims 40 and 43-46 are patentable over JP '567 and Briles

Each of the dependent Claims 40 and 43-46 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over JP '567 in view of U.S. Patent No. 4,159,666 (“Briles”). As noted above, JP '567 does not teach or suggest each of the features of independent Claim 38. Further, Briles fails to cure the above-noted deficiencies of JP '567. That is, Briles does not teach or suggest a refined grain structure for a rivet and, in particular, does not disclose the particular grain structure recited in Claim 38. Accordingly, dependent Claims 40 and 43-46 are also patentable over JP '567 and Briles for the same reasons set forth above in connection with Claim 38.

Further, dependent Claims 44-46 provide additional bases of distinction over JP '567 and Briles. In this regard, each of Claims 44-46 recites that the shank and the head consist essentially of a particular material. For example, according to Claim 44, “said shank and said head consist essentially of a series 2000 aluminum alloy.” Claims 45 and 46 instead recite that the shank and head consist essentially of AA 2195-T6 aluminum alloy (Claim 45) and AA 2017-T4 aluminum alloy (Claim 46). Thus, each of the Claims 44-46 requires that the shank and the head consist of a particular aluminum alloy and the same shank and head consist essentially of a grain structure having a grain size between about 3 microns and 5 microns. In other words, Claim 44 requires that the shank and head consist essentially of a series 2000 aluminum alloy with a grain size between about 3 microns and 5 microns. Claim 45 and 46 require that the shank and head consist essentially of AA 2195-T6 or AA 2017-T4 aluminum alloy with a grain size between about 3 microns and 5 microns.

The final Office Action states that “[t]he particular aluminum alloy is known and would have been recognized to use depending upon the particular application.” Final Office Action

dated March 14, 2006, page 4. The final Office Action does not provide any teaching of a series 2000 aluminum alloy, AA 2195-T6 aluminum alloy, or AA 2017-T4 aluminum alloy that has a grain size in the recited range. Nor does the final Office Action identify any motivation for modifying the materials of the cited references to achieve the claimed invention. For example, the final Office Action does not provide any motivation to reduce the grain size of the materials identified by Briles, and Applicant submits that neither JP '567 nor Briles provides such motivation.

Thus, Applicant respectfully submits that each of dependent Claims 44-46 is patentable over the cited references for this reason, in addition to the reasons cited above in connection with independent Claim 38.

8. ***Claims Appendix.***

An appendix containing a copy of the claims involved in the appeal is attached.

9. ***Evidence Appendix.***

None.

10. ***Related Proceedings Appendix.***

None.

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CONCLUSION

For the above reasons, it is submitted that the rejections of Claims 38-46 are erroneous and reversal of the rejections is respectfully requested.

Respectfully submitted,



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Appendix – Listing of Pending Claims

The claims subject to this appeal are as follows:

Claims 1-37. (cancelled)

38. (previously presented) A rivet comprising:
a shank having a head at one end thereof; and
wherein said shank and said head consist essentially of a grain structure having a grain size between about 3 microns and 5 microns.

39. (previously presented) A rivet according to Claim 38 wherein said shank and said head comprise a material selected from the group consisting of aluminum, an aluminum alloy, titanium, and a titanium alloy.

40. (previously presented) A rivet according to Claim 38 wherein the end of said shank opposite said head is adapted to be upset to form a second head.

41. (previously presented) A rivet according to Claim 38 wherein said shank and said head comprise a refined grain structure formed by stirring with a friction stir welding probe.

42. (previously presented) A rivet according to Claim 38 wherein said shank and said head comprise aluminum.

43. (previously presented) A rivet according to Claim 38 wherein said shank and said head comprise AA 2195-T6 aluminum alloy.

44. (previously presented) A rivet according to Claim 38 wherein said shank and said head consist essentially of a series 2000 aluminum alloy.

45. (previously presented) A rivet according to Claim 38 wherein said shank and said head consist essentially of AA 2195-T6 aluminum alloy.

46. (previously presented) A rivet according to Claim 38 wherein said shank and said head consist essentially of AA 2017-T4 aluminum alloy.

Evidence Appendix

None.

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Related Proceedings Appendix

None.